Differential Vulnerability, Disaster Risk Management & Climate Adaptation: Priorities and Opportunities for Research and Policy

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Risk, Policy, Vulnerability (RPV) Program

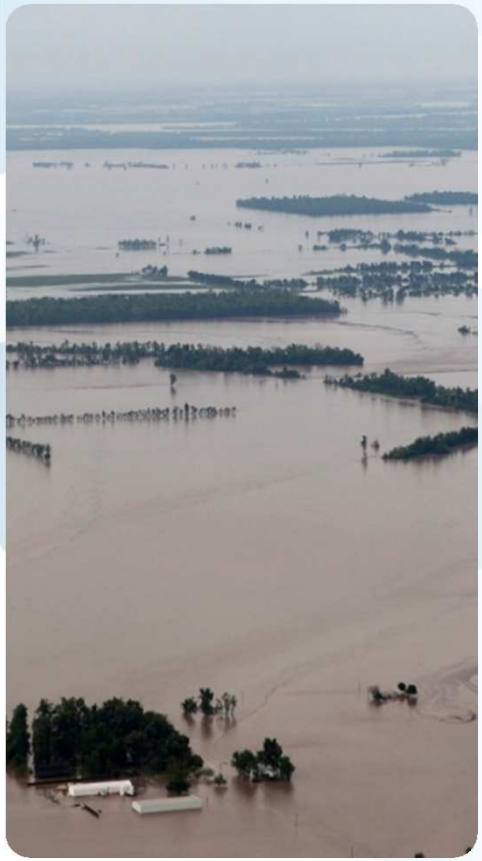
IIASA 40th Anniversary Conference
WORLDS WITHIN REACH: FROM SCIENCE TO POLICY

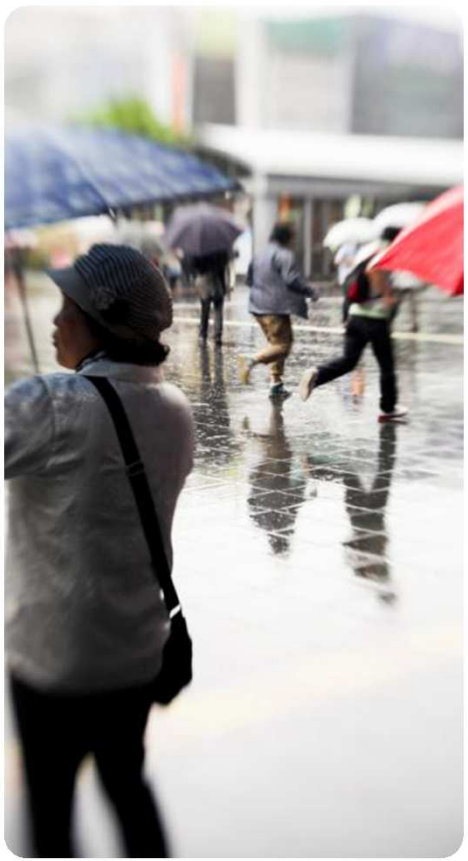
Parallel Session 4: Assessing Education, Human Capital and Vulnerability

October 26, 2012

Context: IPCC Special report on extreme events and adaptation (SREX)

- Impacts from disasters have increased over recent decades
- Anthropogenic climate change leads to changes in extreme weather and climate events!



Source: IPCC, 2012

Natural disasters are *unnatural*
Climate-related and socio-economic determinants of risk

nature and severity of hazard

exposure

vulnerability

Source: IPCC, 2012

Even non-extreme weather and climate events can lead to extreme impacts if vulnerability is high

- Africa's largest recorded cholera outbreak
- over 90,000 affected
- over 4,000 killed
- began following onset of seasonal rains
- vulnerability and exposure increased risk

Source: IPCC, 2012

From climate-driven to vulnerability-driven analysis!

- Projections of natural hazards and climate change associated with long time scales and large uncertainties
- Information on today's differential vulnerability (and exposure) as starting points for disaster risk management and adaptation assessments
- Offering benefits now and foundations for addressing future projected changes

From climate-driven to vulnerability-driven analysis
Starting points are vulnerability and exposure at scale of risk management

Vulnerability & exposure at scale of risk management

From climate-driven to vulnerability-driven analysis
Starting points are vulnerability and exposure at scale of risk management

Vulnerability & exposure at scale of risk management	Information on climate extremes across spatial scales		
	Global: Observed and projected	Regional: Observed and projected	Scale of risk management: Available information

From climate-driven to vulnerability-driven analysis
Starting points are vulnerability and exposure at scale of risk management

<table>
<tr><td rowspan="2">Vulnerability & exposure at scale of risk management</td><td colspan="3">Information on climate extremes across spatial scales</td><td rowspan="2">Options for risk management and adaptation</td></tr>
<tr><td>Global: Observed and projected</td><td>Regional: Observed and projected</td><td>Scale of risk management: Available information</td></tr>
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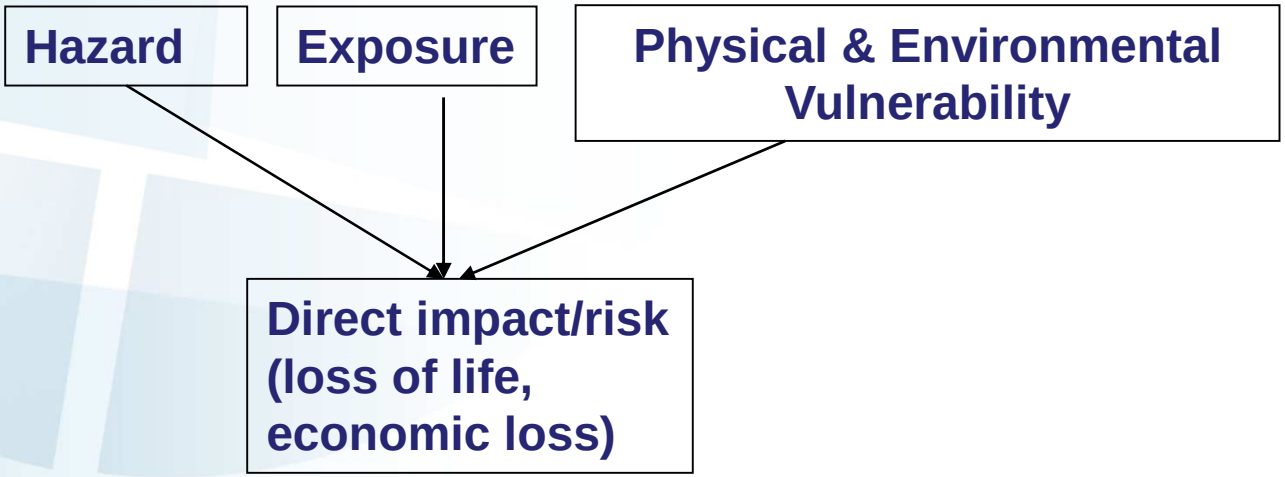
Flow of information

Gaps and priorities in Vulnerability & Risk research

- There are many types of vulnerability and determinants: how to integrate?
- Linking to an estimate of risk
- Lack of useful information on differential vulnerability at scale of risk management (farmers, households, governments)
- Better understanding of longer term, indirect effects

Conceptualizing and modelling vulnerability and risk



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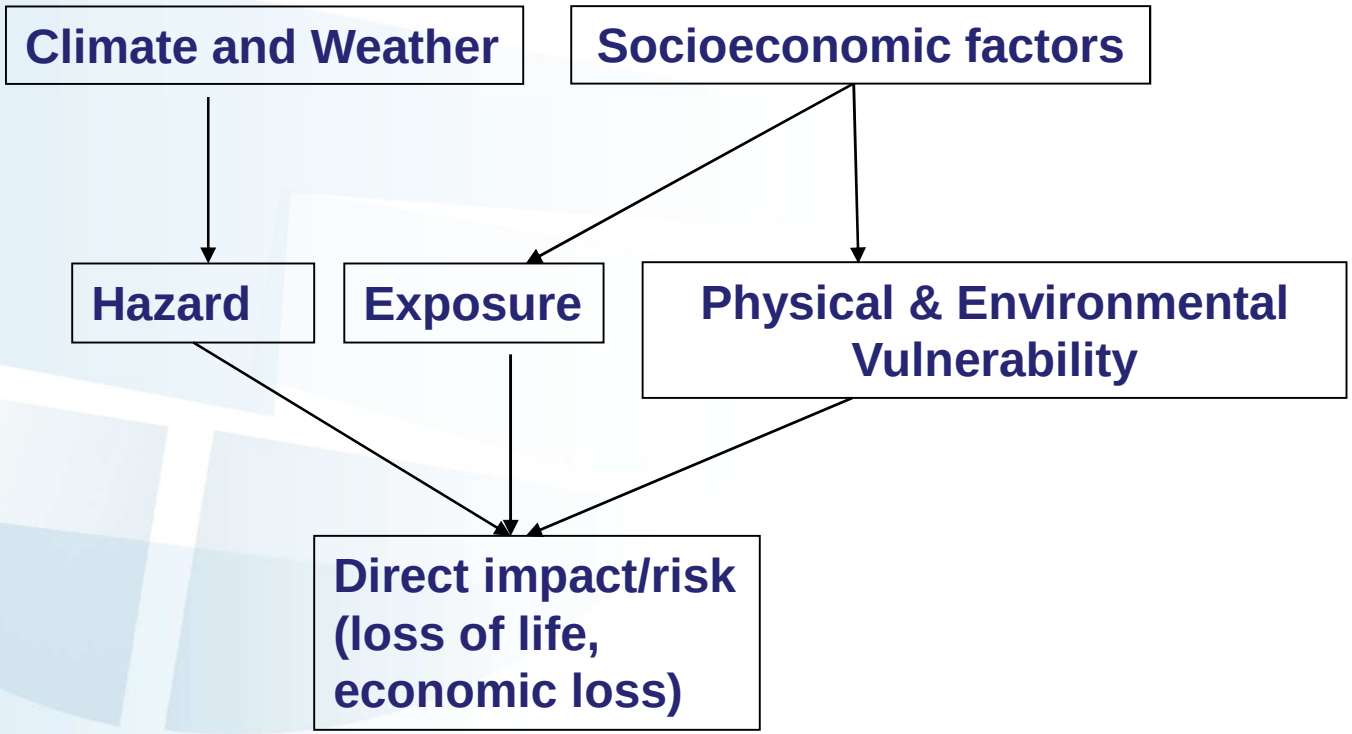

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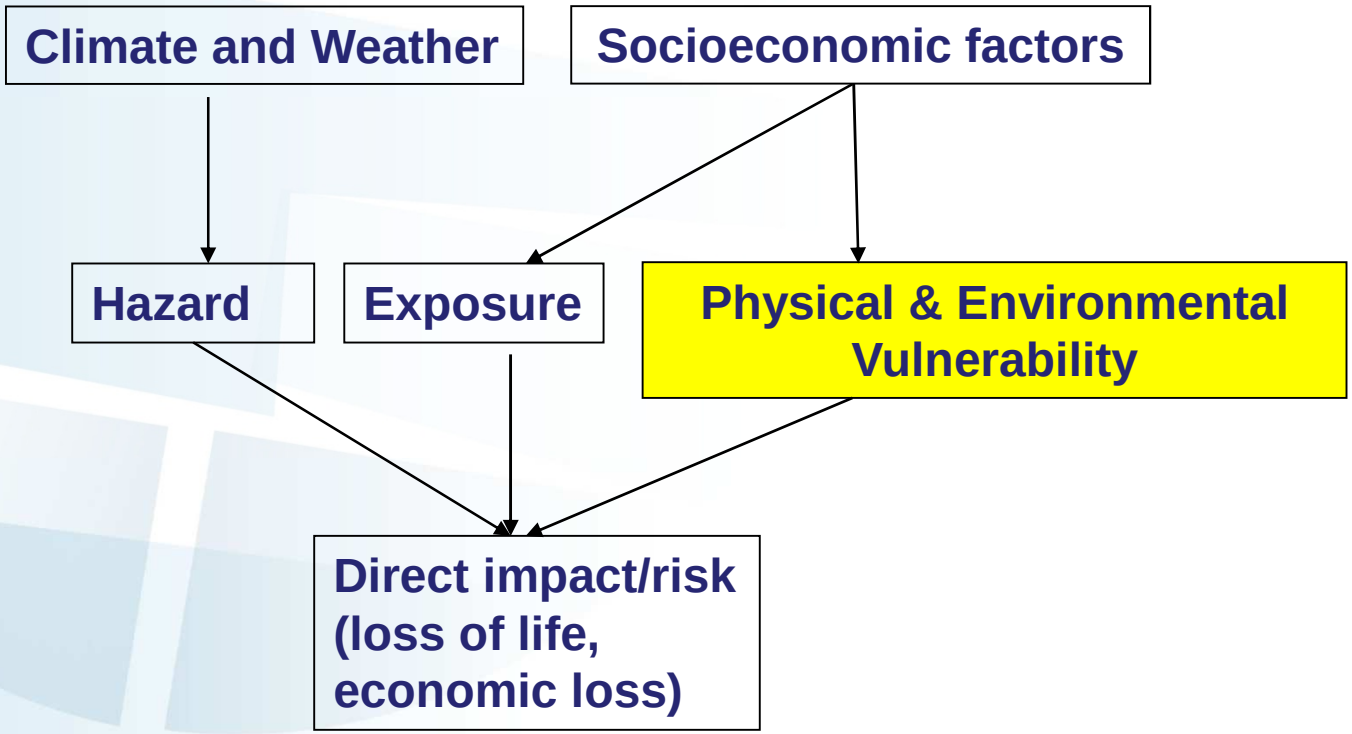

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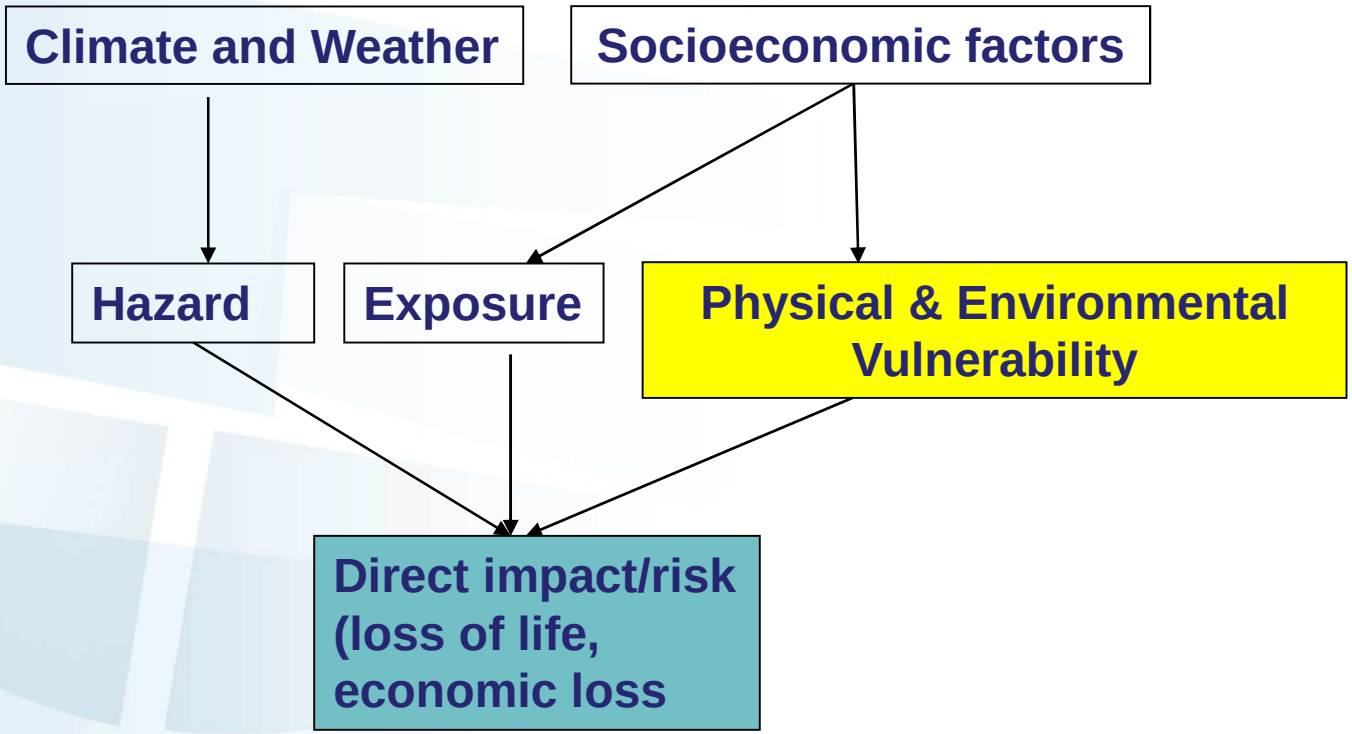

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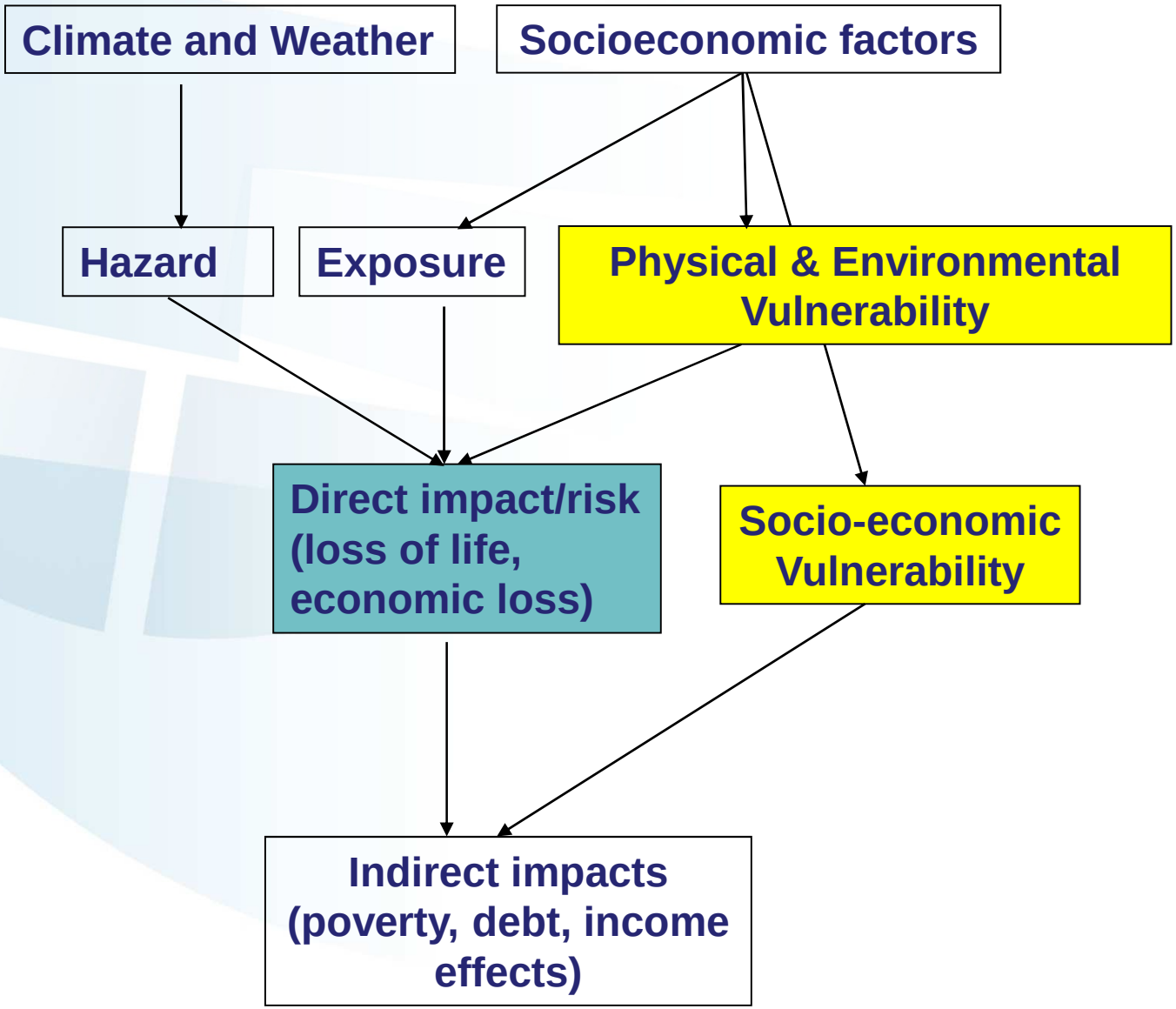

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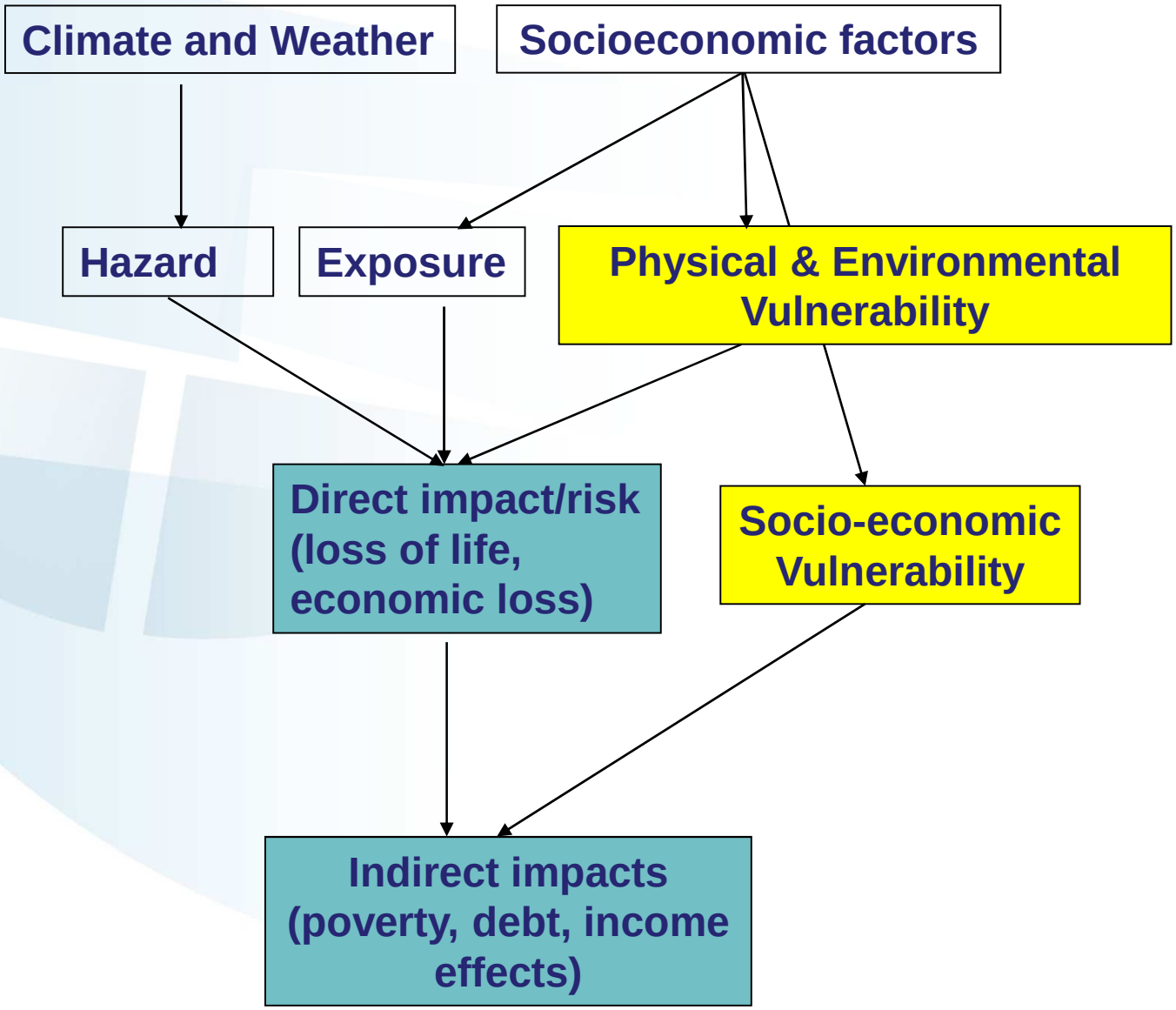


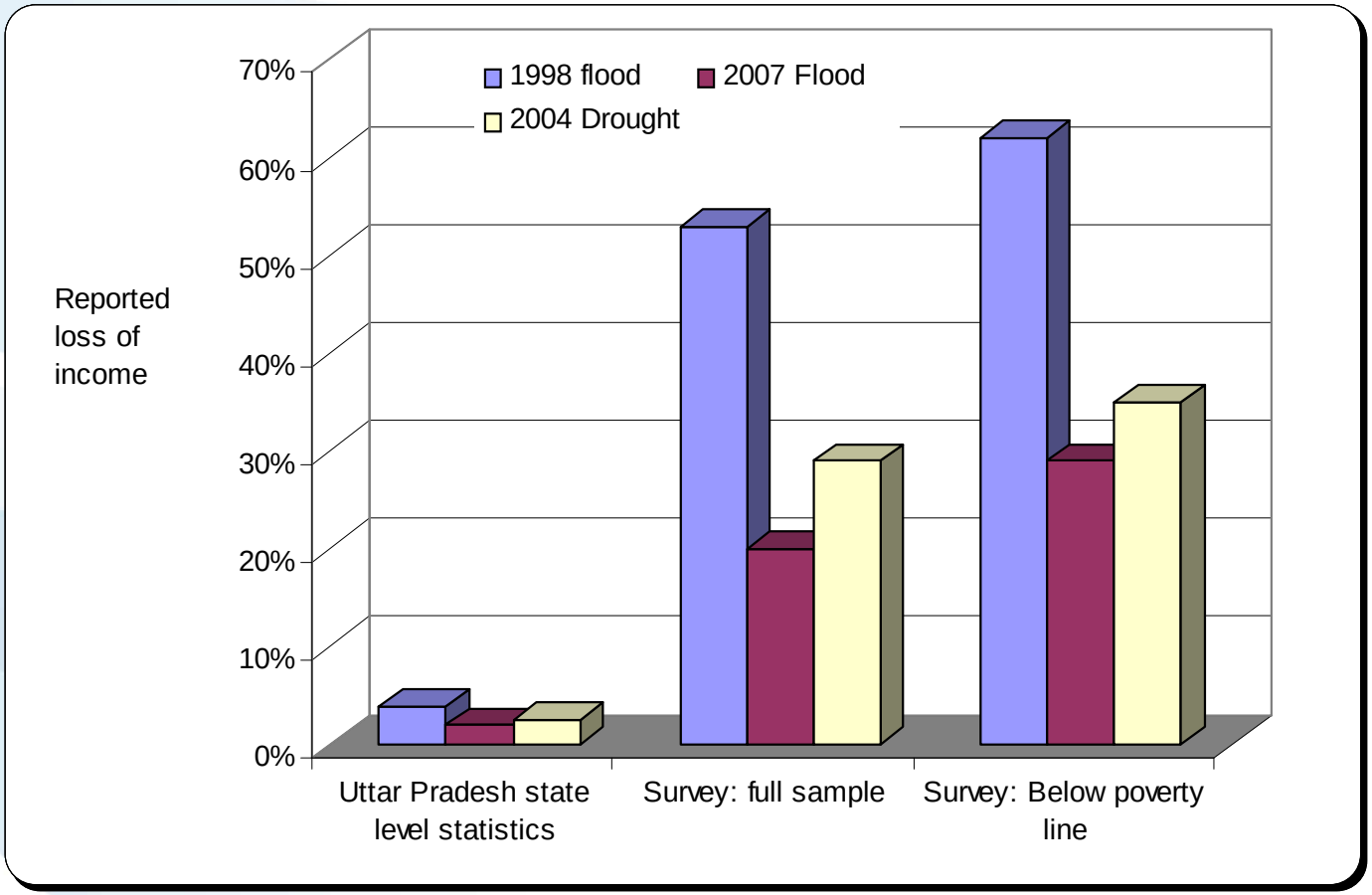
IIASA research

- On macro and micro scales
- Focus on set of micro-scale assessments: Understanding interplay of extremes, risk and poverty for subsistence farming households in Asia and Africa
- Informing implementation of mechanisms to lift farmers out of poverty

Focus 1: Modelling extremes and poverty in Uttar Pradesh, India

- How do disasters affect livelihoods of subsistence farmers?
- Survey in 2 villages with n=204
- Study partners:
  - Institute for Sustainable Environmental Transitions, Nepal
  - Gorakhpur Environmental Action Group, India
  - Winrock International, India

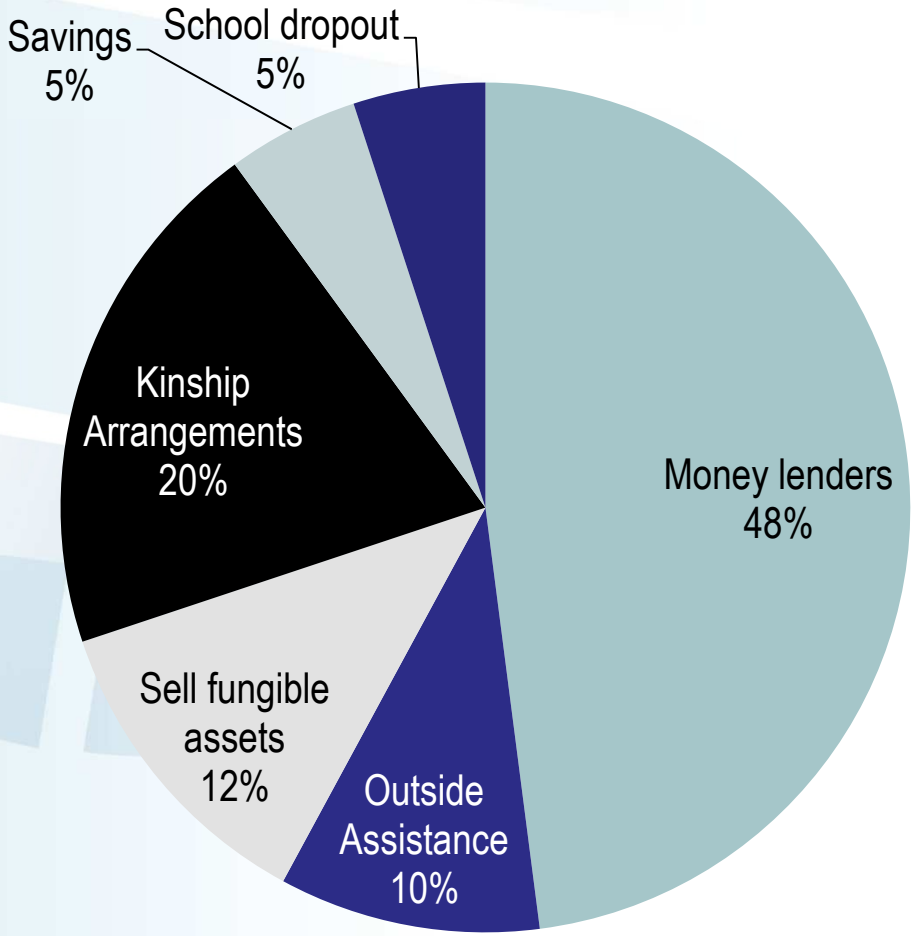
Focus 1: Uttar Pradesh, India
Survey reports differential direct impacts



Survey results on direct losses in drought and flood events

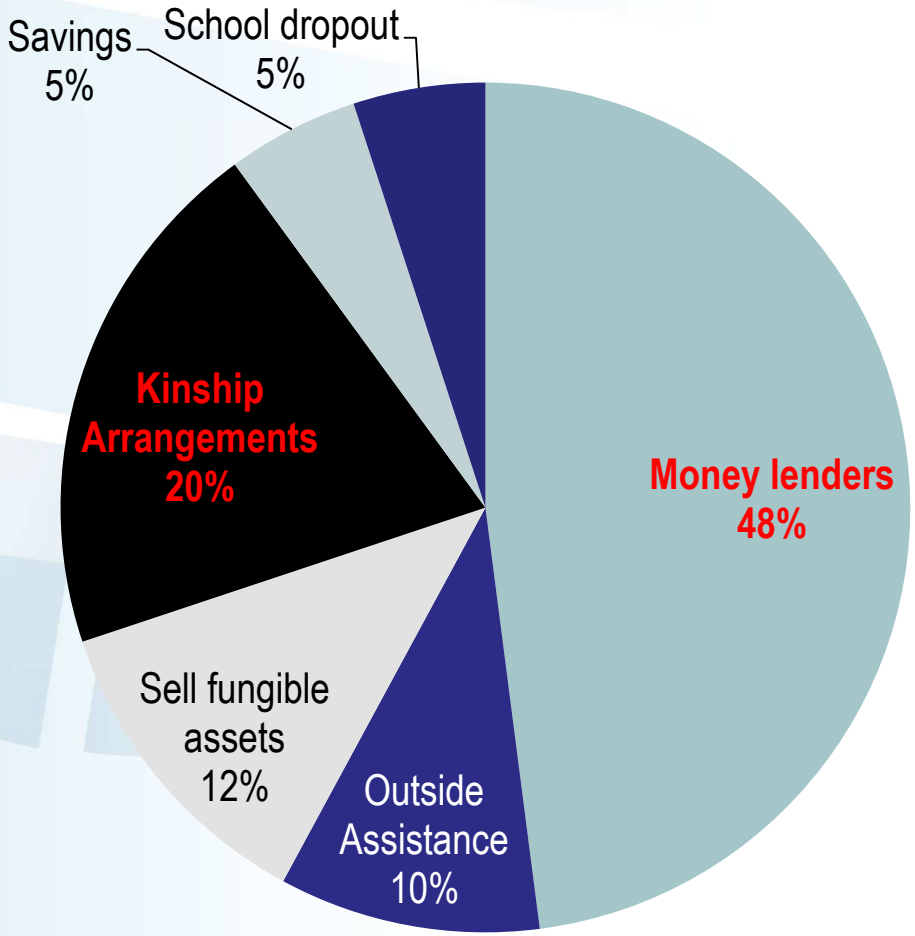
Sources: Mechler et al., ProVention Consortium working paper #5, 2009
Hochrainer et al., Journal Mass. Emergency&Disasters, 2011

Focus 1: Uttar Pradesh, India
Survey results on coping mechanisms



Hochrainer et al., 2011

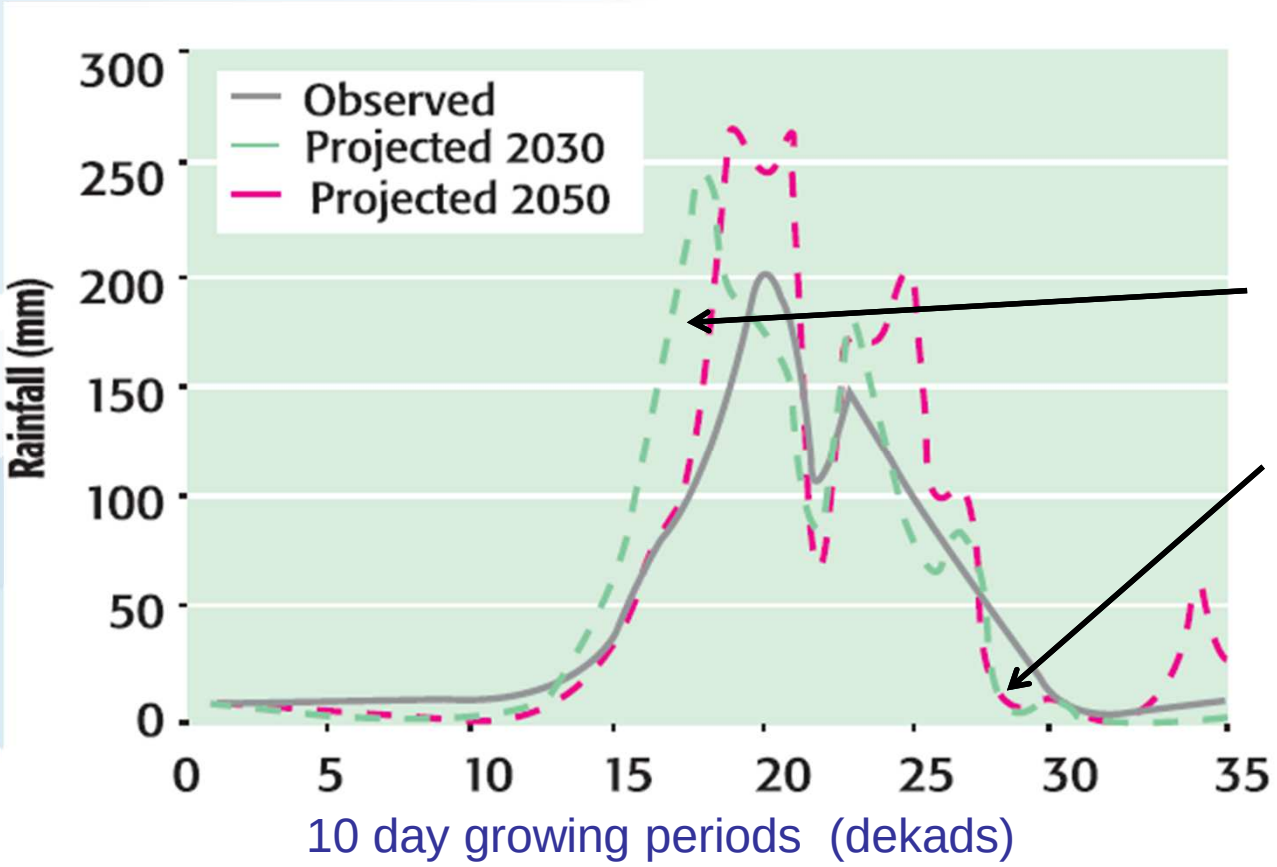
Focus 1: Uttar Pradesh, India
Survey results on coping mechanisms



Access to economic and social capital important

Hochrainer et al., 2011

Focus 1: Uttar Pradesh, India
… coupled with hazard: precipitation and changes



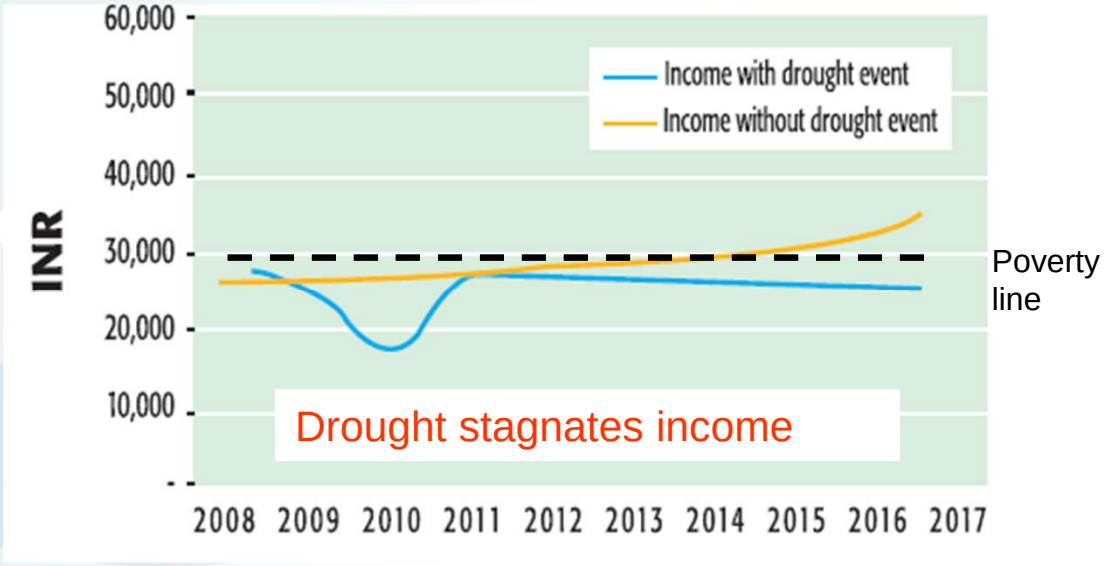
Projections of climate change suggest

- More rainfall early in the main growing season
- Less rainfall later on during harvesting

Distribution of rainfall over 10 dekads
(A2 scenario in CGMC3 climate model)

Source: Mechler et al., 2009

Focus 1: Uttar Pradesh, India
... can be combined to an estimate of longer term risk



Poverty line

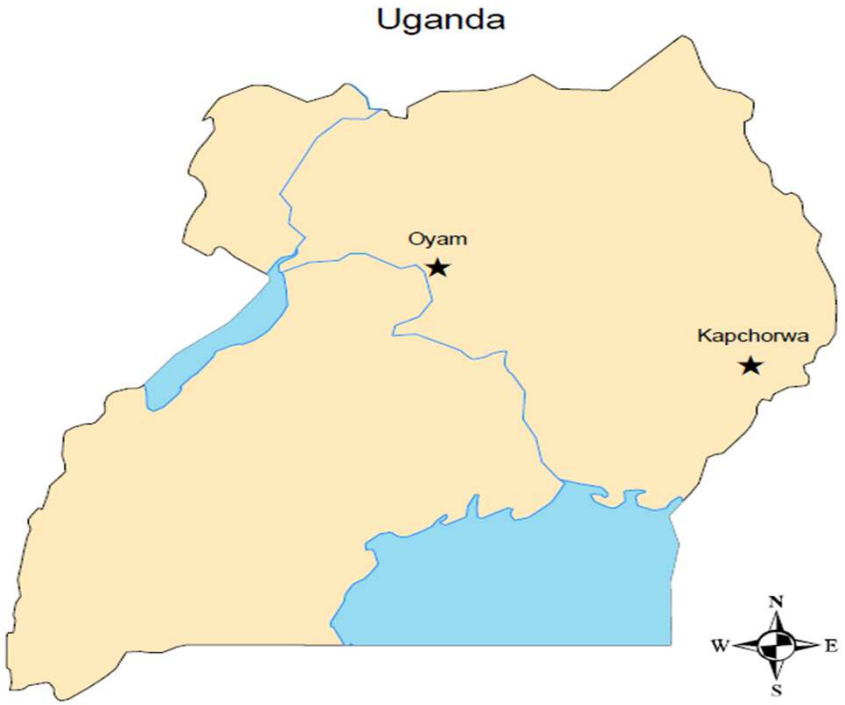
Points toward options accessing economic and social capital: community-based and donor supported microinsurance

Income dynamics with a drought shock as compared to a baseline for a representative farming household

Source: Mechler et al., 2009

Focus 2: Understanding vulnerability and coping strategies in rural Uganda

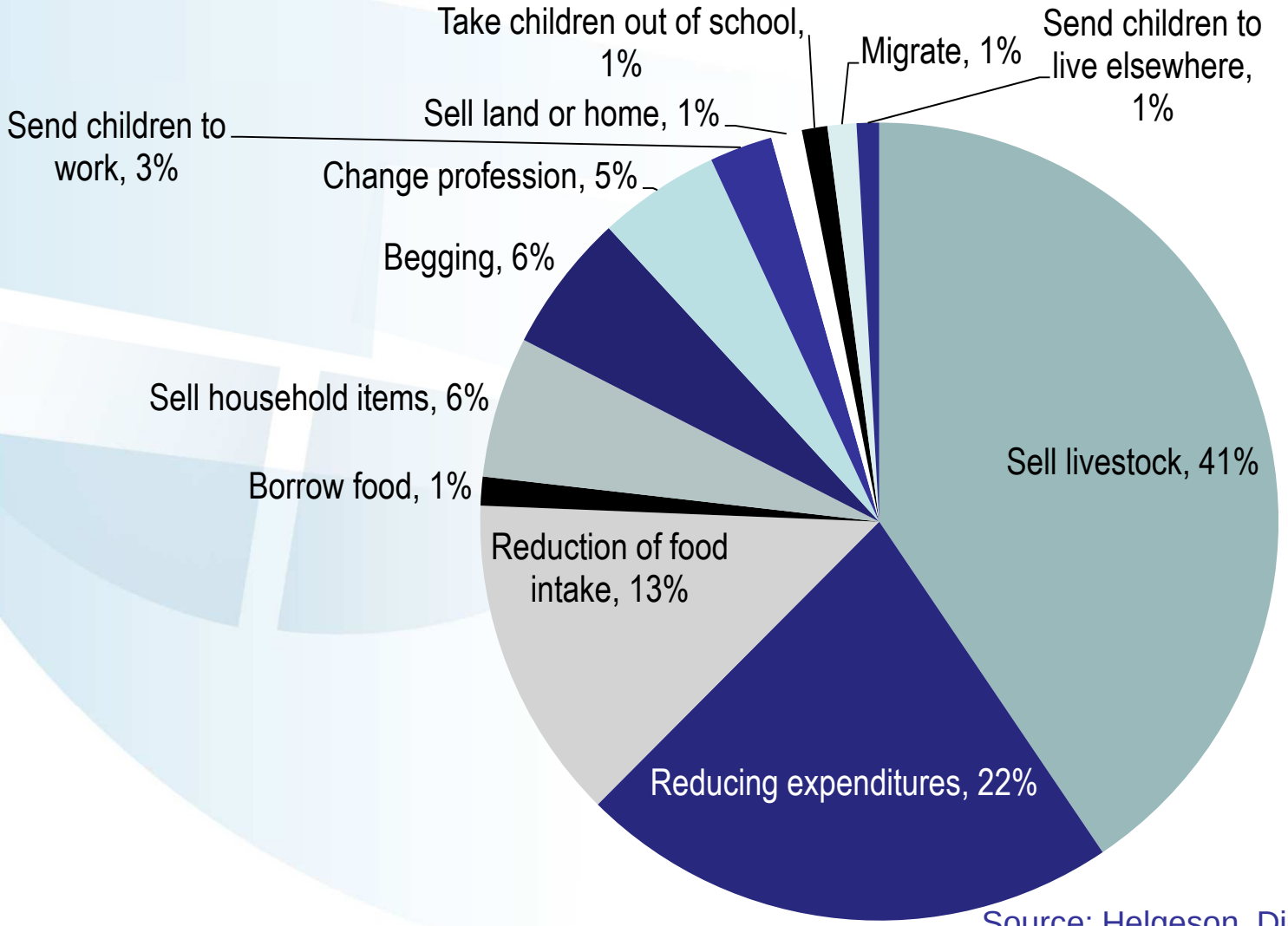
- Apart from economic factors, what other determinants shaping vulnerability and coping?
- Survey in two districts, garnered by knowledge workers using smart-phone technology n=3258
- Partners:
  - LSE
  - Grameen Foundation, Uganda



Study areas in Uganda

Source: Helgeson, Dietz, Hochrainer
Ecology and Society, *accepted*

Focus 2: Uganda
Coping strategies



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Focus 2: Uganda
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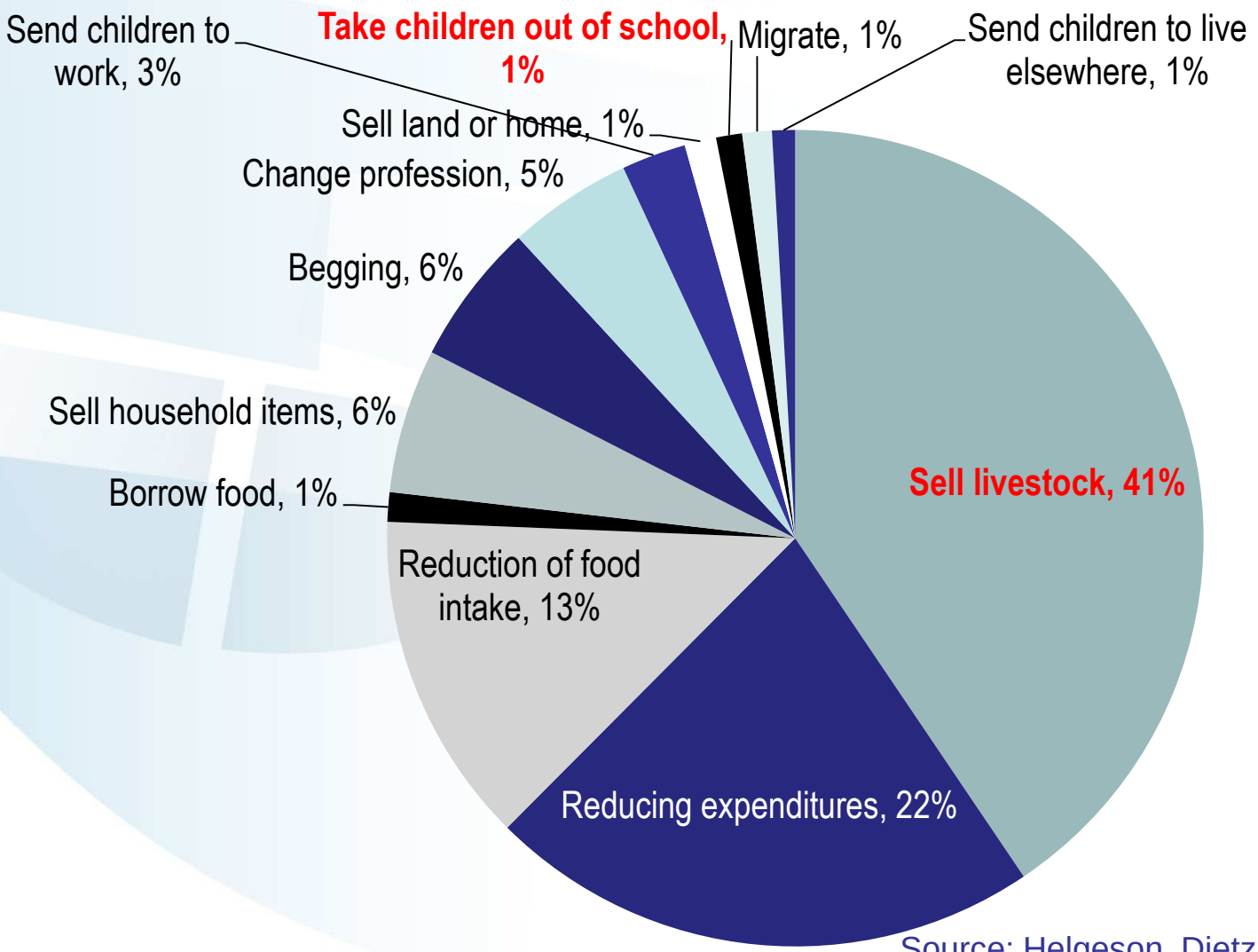

Source: Helgeson, Dietz, Hochrainer
Ecology and Society, *accepted*

Focus 2: Uganda

Probit regression results on determinants of coping strategies

- Livestock sale as dominant coping strategy:
  - Economic determinants (capital) important
  - e.g. crop surplus and share of income from farming reduce odds of selling livestock

- Reduced access to formal education: also human capital important:
  - Households with a more educated head less likely to choose coping strategies affecting children's educational attainment
  - Points towards benefits of investing into human capital

Conclusions

- Extreme events exert heavy toll on affected, particularly lower income, farming households
- IIASA research in South Asia and Africa derives locale-specific information on differential vulnerability and risk
- Dominant coping strategies are shaped by factors related to economic capital, but also human and social capital play a role
- Focus on today's and future vulnerabilities as starting points for analyses of disaster risk management and climate adaptation